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METATHETELOUS LARVA OF TELEA POLYPHEMUS.—DAWSON.

ENTOMOLOGICAL NEWS

VOL. XLII. MAY, 1931 No. 5

Report of Two Cases of Metathetely in Polyphemus Larvae (Telea polyphemus Cramer) (Lepid. : Saturniidae).

By R. W. DAWSON, Department of Zoology, University of Minnesota.

(Plate III.)

The following observations were made incidentally during the progress of an experimental study of the ecological responses of the polyphemus moth to the climatic phase of its environment.[1] Fifty-five eggs from a mating of Nebraska stock were incubated at 25° C. and the emerging larvae reared on a progressively declining temperature scale, following the series of mean normal temperatures characteristic of the climate at Lincoln, Nebraska from late July to middle September. This temperature progression follows:

25.0° C.	for 11 days (incubation of eggs)	19.4° C.	for 3 days
23.3° C.	for 4 days	18.8° C.	for 3 days
22.7° C.	for 5 days	18.3° C.	for 3 days
22.2° C.	for 4 days	17.7° C.	for 3 days
21.6° C.	for 3 days	17.2° C.	for 3 days
21.1° C.	for 3 days	16.6° C.	for 3 days
20.5° C.	for 3 days	16.2° C.	for 3 days
20.0° C.	for 3 days		

The object of the experiment was to induce dormancy in the first cycle, comparable to that occurring in the second at the close of the growing season. The treatment did not induce dormancy, but was possibly the cause for two cases of "metathetely", or partially arrested metamorphosis appearing among the larvae. At least one would suspect a causal connection with the descending temperature, since such cases are not common among lepidopterous larvae, and were not otherwise noted among the hundreds of polyphemus larvae reared in the general experiments, nor among the 148 other larvae reared to maturity from the same mating.

[1] Journal of Experimental Zoology, Feb., 1931.

The two larvae under consideration attained full size, and instead of evacuating the digestive tract and then spinning, as is the normal procedure, "sat up" to molt, but without first spinning the necessary and characteristic silken carpet employed in detaching the skin. In both cases molting occurred on the fourth day, and was accomplished with difficulty, and only then through supplementary aid. The chief obstruction to casting the skin was the adhesion of the tracheal lining which in some tubes could not be dislodged. The head capsule and mouth parts assumed large dimensions appropriate for a sixth and monstrous instar. The antennae were greatly distended with fluid, and the thoracic legs somewhat so, which rendered them useless. The prolegs lost their microscopic, prehensile hooks, and also became useless. The larvae became very weak and flaccid, and lost all impulses either to feed or crawl, lying quietly on their sides like prepupae. Small amounts of fluid faeces were passed, and after four or five days of progressive decline death occurred. The accompanying life-sized photograph conveys a good impression of the strange condition of these unfortunate larvae.

Comparable phenomena occurring in the confused flour beetle, *Tribolium confusum* Duval, and a review of the literature relating to the subject of metathetely are given by Royal N. Chapman in the Journal of Experimental Zoology, 45, pp. 293-299, 1926.

A List of the Existing Entomological Societies in the United States and Canada.

In the NEWS for July, 1930, page 218, appeared a note from Dr. L. O. Howard suggesting our publishing a list of these societies with an indication of their membership. Endorsing this suggestion, we requested data from the secretaries of all such associations. Following is the result. Some responses have been so much delayed that the information here presented is not all of the same date. Errors may, however lead to corrections from the organizations listed and such will be published as promptly as possible after receipt. Use has also been

made of the "Bulletin of the National Research Council, May 1930, Number 76. Handbook of Scientific and Technical Societies and Institutions of the United States and Canada. Second edition." The societies are listed in chronological order according to date of foundation.

Entomological Society of Philadelphia, founded February 22, 1859, name changed to THE AMERICAN ENTOMOLOGICAL SOCIETY, February 23, 1867. Address 1900 Race Street, Philadelphia, Pennsylvania. President, Roswell C. Williams, Jr.; Recording Secretary, Dr. R. G. Schmieder; Corresponding Secretary, J. A. G. Rehn. Resident members 61, Corresponding members 56, Honorary member 1. Current publications: *Transactions* since 1868, *Entomological News* since 1890. A history of the Society, by E. T. Cresson, was published separately by the Society in 1909.

ENTOMOLOGICAL SOCIETY OF ONTARIO, founded April 16, 1863. Address Ontario Agricultural College, Guelph, Ontario, Canada. President, Dr. J. D. Detwiler; Secretary, R. H. Ozburn. Active members 145, Honorary members 5. Current publications: *Annual Report* since 1870, *Canadian Entomologist* since 1868.

BROOKLYN ENTOMOLOGICAL SOCIETY, founded 1872. Address c/o Brooklyn Museum, Eastern Parkway, Brooklyn, New York. President, W. T. Davis; Secretary, Ernest L. Bell. Active members 58, Life members 3, Honorary members 5. Current publications: *Bulletin* (new series) since 1912, *Entomologica Americana* (new series) since 1926. Mr. George P. Engelhardt published a paper "Brooklyn and New York Entomological Societies, Past and Present" in Annals of The Entomological Society of America, volume xxii, number 3, pages 392-400, September 1929.

MONTREAL BRANCH, ENTOMOLOGICAL SOCIETY OF ONTARIO, founded October 16, 1873. Address Lyman Room, Redpath Museum, McGill University, Montreal, Canada. President, George A. Moore; Secretary, John W. Buckle. Active members 18, Honorary members 0.

CAMBRIDGE ENTOMOLOGICAL CLUB, founded January 7, 1874. Address Museum of Comparative Zoology, Cambridge, Massachusetts. President, C. A. Frost; Secretary, P. J. Darlington, Jr. Active or resident members 90, Corresponding members 0, Honorary life members 2. Current publications: *Psyche* since 1874.

ENTOMOLOGICAL SOCIETY OF WASHINGTON, founded February 29, 1884. Address 1729 New York Avenue, Washington,

D. C. President, A. C. Baker; Recording Secretary, J. S. Wade; Corresponding Secretary, S. A. Rohwer. Active members 186, Honorary members 0. Current publication: *Proceedings* since 1884.

American Association of Economic Entomologists, organized 1889 as the Association of Official Economic Entomologists. Address Melrose Highlands, Massachusetts. President, J. S. Houser; Secretary, A. F. Burgess. Active members 602, Associate members 550, Foreign members 52, Life members 6. Current publication: *Journal of Economic Entomology* since 1908.

The New York Entomological Society, founded June 29, 1892. Address c/o American Museum of Natural History, 77th Street and Central Park West, New York, N. Y. President, Andrew J. Mutchler; Secretary Miss Elizabeth Sherman. Active members 130, Corresponding members 0, Honorary members 1. Current publication: *Journal* since 1893. A history of the Society from 1893 to 1918 by Charles W. Leng was published in the *Journal*, xxvi, pages 129-133. See also under Brooklyn Entomological Society above.

Jugatae, Graduate Students' Seminar in Entomology, founded February 26, 1897. Address Cornell University, Ithaca, New York. Chairman, Alexander B. Klots. Active members 65, Corresponding members 0, Honorary members 0.

Pacific Coast Entomological Society, founded August 7, 1901, as the California Entomological Club. President, E. C. Van Dyke; Secretary, J. O. Martin, 2617 Derby St., Berkeley, California. Active members 80, Honorary members 5. Current publications: *Proceedings* since 1901, *Pan-Pacific Entomologist* since 1924.

Entomological Society of British Columbia, founded 1901, reorganized 1903. Address Agassiz, British Columbia. President, J. W. Winson; Secretary, R. Glendenning. Active members 35, Corresponding members 0, Honorary members 0. Current publication: *Proceedings* since 1911, *Quarterly Bulletin* since 1908.

Hawaiian Entomological Society, founded December 15, 1904. Address Experiment Station, Hawaiian Sugar Planters Association, Honolulu, Hawaii. Active members 20, Corresponding members 5, Honorary members 2. Current publication: *Proceedings* since 1905.

St. Louis Entomological Club, founded April 16, 1904. Secretary, Hermann Schwarz, 720 Clark Ave., Webster Groves, Missouri. Active members 8, Corresponding members 0, Honorary members 0.

THE ENTOMOLOGICAL SOCIETY OF AMERICA, founded 1906. Address c/o Secretary, Purdue University, Lafayette, Indiana. President, Dr. Edith M. Patch; Secretary, J. J. Davis. Active members 814, Fellows 100. Honorary fellows 4. Current publication: *Annals* since 1908.

LORQUIN ENTOMOLOGICAL SOCIETY, founded 1913, as the Lorquin Natural History Club. Address Los Angeles Museum, Exposition Park, Los Angeles, California. President, Dr. John A. Comstock; Secretary, John Garth. Active members 60, Corresponding members 0, Honorary members 12.

FLORIDA ENTOMOLOGICAL SOCIETY, founded January 5, 1916, Address Florida Agricultural Experiment Station, University of Florida Campus, Gainesville, Florida. President, C. F. Byers; Secretary, W. L. Ziegler. Resident members 30. Non-resident members 75, Honorary members 5. Current publication: *The Florida Entomologist* since 1917.

POPENOE ENTOMOLOGICAL CLUB, founded 1923. Address Kansas State Agricultural College, Manhattan, Kansas. President, P. G. Lamerson; Secretary, H. L. Caler. Active members 25, Corresponding members 0. Honorary members 0.

KANSAS ENTOMOLOGICAL SOCIETY, founded April 9, 1925. Address Kansas State Agricultural College, Manhattan, Kansas. President, George A. Dean; Secretary, Dr. R. L. Parker. Active members 51, Corresponding members 67, Honorary members 0. Current publication: *Journal* since 1928.

ENTOMOLOGICAL CLUB OF SOUTHERN CALIFORNIA, founded September 17, 1926. President, R. S. Woglum; Secretary, H. M. Armitage, 330 North Broadway, Los Angeles, California. Active members 250, Corresponding members 0, Honorary members 0.

CLEVELAND ENTOMOLOGICAL SOCIETY, founded 1927. Address Cleveland Museum of Natural History, Cleveland, Ohio. President, Henry Wormsbacher; Secretary John C. Pallister. Active members 22, Corresponding members 0, Honorary members 0.

TEXAS ENTOMOLOGICAL SOCIETY, founded 1928. President, S. W. Bilsing; Secretary, Dr. M. A. Stewart, The Rice Institute, Houston, Texas. Members 75 (from *Science* for March 20, 1931, page 310).

ENTOMOLOGICAL CLUB AT THE UNIVERSITY OF KANSAS. Address Lawrence, Kansas. President, Lauren D. Anderson; Secretary, Bonnie LaMaster. Active members 26, Corresponding members 0, Honorary members 0.

The totals of this List are Societies, etc., 22, and of members:

active (resident) 2851, non-resident 75, corresponding 128, honorary 42, life 9, associate 550, foreign 52, fellows 100. The names applied to the classes of members have different meanings in different societies. There are many duplications in the totals of membership; thus a large number of those persons enrolled in the two national societies (American Association of Economic Entomologists, Entomological Society of America) are members of both of these societies and are also members of one or more of the local societies.

A Claim for Priority in Dividing Pterygotan Insects into Two Sections on the Basis of the Position of the Wings in Repose, with Remarks on the Relationships of the Insect Orders.

By G. C. CRAMPTON, Ph.D., Massachusetts State College, Amherst, Mass.

Recently, entomologists such as Bradley, 1931 (*Laboratory Guide to the Study of the Wings of Insects**), Tillyard, and others, have begun to stress the importance of separating winged insects into two divisions on the basis of the method of holding their wings outstretched or folding them along the top of the abdomen in repose (*i.e.*, the division into Archipterygota and Neopterygota). Most surprisingly, however, these entomologists, who are trained taxonomists meticulously careful to give exact chronological preference to the first description of a species or similar taxonomic group (even going to

[*Dr. Bradley has written to the Editor of the NEWS as follows: "In the wing venation guide which I have recently published, I inadvertently credited Martynov with division of the Pterygota into two groups on the basis of whether the wings were folded or not. Crampton subsequently called my attention in a letter to the fact that he had made that division before Martynov, and had used the terms Archipterygota and Neopterygota. I have therefore made this change in a correction sheet for my wing guide . . . and have also called attention to the fact that Crampton was the first to so divide the Pterygota. I would be very pleased if you would insert an editorial footnote to [that] effect . . . as I should not like to have people feel that I had intentionally refused to recognize Crampton's work." The Editor is glad to add this to Dr. Crampton's paper.]

such extremes as to give page preference, etc., where two descriptions occur in the same publication), nevertheless, insist upon accrediting the first division of insects on the basis of the position of the wings to Martynov, 1924, whose divisions "Palaeoptera" and "Neoptera" were not published until several months after the actual first publication of such a division, on exactly the same basis, made by me, and despite the fact that Martynov's terms, such as the designation "Palaeoptera", had already been used by me five years before (in 1915) to designate a group of ordinal rank, including the Blattids, which do not hold the wings outstretched in repose, and therefore could not be placed in Martynov's group "Palaeoptera".

In the *June*, 1924, issue of the Journal of Entomology and Zoology, Vol. 16, No. 2, p. 33, the first published proposal to divide the Pterygota into two divisions (the Archipterygota and Neopterygota) on the basis of the position of the wings in repose, was made by me, and it was not until months later, in the *fall* of 1924 that Martynov's paper appeared in the Revue Russe d'Entomologie, Vol. 18, p. 145, in which he proposed to group winged insects into the "Palaeoptera" and "Neoptera" on exactly the same basis—namely, the method of holding the wings in repose. The Journal of Entomology and Zoology is a publication of recognized standing and has a wide circulation, and since its June issue preceded the fall issue of the Revue Russe d'Entomologie by several months, there can be no question as to which article has priority of publication. Furthermore, Martynov's term "Palaeoptera" is preoccupied, having been applied by me to the order to which the Blattids belong, in a paper published in Vol. 26 of the ENTOMOLOGICAL NEWS for October, 1915, p. 249, so that this name was used for a group of insects which could not possibly be included in Martynov's division "Palaeoptera", and was published nine years before the paper by Martynov, 1924. It may also be remarked in passing, that it is undesirable to apply designations ending in "ptera" to groups other than those of ordinal and superordinal rank, so that the designations "Palaeoptera" and "Neoptera" for the two divisions of the Pterygota are not

so appropriate as the designations Archipterygota and Neopterygota which Martynov has attempted to supplant with his own designations, but on the basis of priority, availability, and appropriateness the terms Archipterygota and Neopterygota clearly have precedence, and even if this were not so, Martynov's term "Palaeoptera" would have to fall as a synonym, having been preoccupied by me in 1915.

While the first actual division of the Pterygota into two divisions (the Archipterygota and Neopterygota) on the basis of the position of the wings in repose was published in the June, 1924, issue of the Journal of Entomology and Zoology, this was by no means the first mention of the fact that insects which hold the wings outstretched in repose form a group of closely related insects, as the following quotation from page 116, Vol. 27, No. 5, of Psyche, for 1920, will show . . . "As was pointed out in the August, 1919, issue of the Transactions of the Entomological Society of London (p. 93), the Ephemerida, Odonata, and certain Palaeodictyoptera form a group characterized by their inability to fold their wings flat along the top of the abdomen, and in an article in the May, 1920, issue of the Proceedings of the Entomological Society of Washington (Vol. 22, p. 98) these insects, together with their immediate relatives (*i.e.*, the Protephemerida, Ephemerida, Protodonata, Odonata, certain of the Palaeodictyoptera, etc.), were grouped in an ancestral superorder of insects . . ." The foregoing verbatim quotation from a publication appearing four years before Martynov's paper, will clearly prove that I had long considered that the insects which hold the wings outstretched in repose form a natural group (and likewise cited the chief representatives of this group), but it was not until the June, 1924, issue of the Journal of Entomology and Zoology, that an actual division of the Pterygota into two clear cut divisions was made by me or by anyone else.

Martynov, 1924, has inserted so many different dates at various points in his article (a translation of which is given by F. M. Carpenter, in the September, 1920, issue of Psyche, Vol. 37, p. 245) that the reader may get the false impression that

some of these various dates refer to installments of the 1924 paper published at various times; but, by referring to the original article, one may readily see that the first report (dated 1922, although it was not published until the 1924 article) and the date of handing the manuscript to the press in 1923, together with the postscript added before the whole was published in the fall of 1924, were all published at the same time, under a single title, in the fall of 1924 (*l.c.*) months after the publication of the article by me in the June, 1924, issue of the Journal of Entomology and Zoology.

Discrepancies between the dates inserted and the statements made in the text itself, make it impossible to determine what was in the original manuscript, and what was later inserted before the publication of the whole paper in 1924. Thus, Professor Martynov states on page 168 of his paper in the Revue Russe d'Entomologie for 1924 (or on page 275 of the 1930 translation by Carpenter), that he was still collecting material in October, 1923, to be used in the preparation of his paper, while in a footnote on page 145 of the original article in Russian (or on page 245 of the 1930 translation by Carpenter) appears the statement that the completed manuscript was in press six months before this, in May, 1923, and to clinch the matter the date May, 1923, was again inserted at the end of the discussion as a "finis" on page 170 of the Russian paper (or on page 278 of the 1930 translation), although it is difficult to understand how one could still be collecting material to work in October and include his findings in a manuscript already in the hands of the publisher six months before in May. Discrepancies of this kind make the inserted dates absolutely meaningless for determining what was in the original manuscript and what was later added before the whole article, together with the postscript added in the fall of 1924, was published later in the fall of 1924. At any rate, the actual date of publication, not the dates inserted by the writer, is what determines priority in such matters, and the fact remains that the statements published in this article, including its various inserted dates, were not made till later in the fall of 1924, while in the

previous June of that year, the same division of the Pterygota into two divisions based upon the method of holding the wings in repose, had already been published by me, thus clearly establishing published priority, which is all that counts in such matters, and Martynov's terms "Palaeoptera" and "Neoptera" cannot possibly have precedence over the earlier terms Archipterygota and Neopterygota, for exactly the same insects divided upon exactly the same basis.

On page 224 of the Canadian Entomologist for October, 1922, I had already pointed out that " . . . it would be impossible to derive such a type as the Homopterous wing shown (in the figures) from that of *Eugereon* which is supposed to represent the type ancestral to the Homoptera and Hemiptera, so that it is much more probable that the ancestors of the Homoptera and Hemiptera were very like the common Protorthopteron-Protoblattid stem. . . . *Eugereon*, however, is more like the Palaeodictyoptera and it possibly may be regarded as a specialized Palaeodictyopteron", and on page 222 of the same paper published in 1922, the Hemipterous insects were correctly placed in the group containing the Psocids, Mallophaga, Pediculids, Thysanoptera, Heteroptera and Homoptera. Furthermore, in the June, 1924, issue of the Journal of Entomology and Zoology, published five months before the paper by Martynov, 1924, I definitely separated *Eugereon* from the Hemiptera because *Eugereon* held its wings outstretched in repose, and placed the Hemiptera in the division Neopterygota, because they lay their wings along the abdomen in repose. Martynov, 1924, is therefore mistaken in supposing that he was the first to call attention to the distinct grouping of *Eugereon* and the Hemiptera, and he did not even indicate the correct position of the Hemiptera within the group of insects including the Psocids, Mallophaga, Pediculids, Thysanoptera, etc. The conclusive reasons for separating the Hemiptera from such forms as *Eugereon*, however, were not given in detail by anyone so far as I am aware, before the detailed comparison given in the February, 1927, issue of the Bulletin of the Brooklyn Entomological Society, Vol. 22, p. 1.

In a footnote on page 169, Martynov, 1924 (*l.c.*) accredits Lameere, 1917, with being the first to indicate that the Plecoptera are Orthopteroids. Martynov does not include Lameere in his list of references, but he evidently refers to a casual statement by Lameere, 1917, on page 103 of the Bulletin de la Societe entomologique de France, Seance du 28 fevrier 1917, which may be translated as follows: "The Perlids are Orthoptera with aquatic larvae very distinct from those of the Subulicornes; (while) on the contrary, the larvae of the Ephemerids and Libellulids are not fundamentally different." Two years before this, however, on page 346 of the October issue of the ENTOMOLOGICAL NEWS for 1915, I had already pointed out that "The insects which group themselves about the Plecopteron center constitute a second supersection . . . and all are the descendants of very similar ancestors. Here belong the following orders: Plecoptera, Embiid-like insects, Dermaptera, Grylloblattid-like forms, Zoraptera, Isoptera, Phasmid-like forms, Phyllium-like forms, grasshopper-like forms, Orthoptera and others." The only evidence cited in this paper for assigning the Plecoptera to this Orthopteroid group, however, is the statement that immature Dermaptera such as *Dyscritina, Karschiella, Bormansia,* etc., have cerci like those of the Plecoptera, so that this reference to the position of the Plecoptera among the Orthopteroids is fully as casual as Lameere's brief statement published two years later. On page 408 of the November issue of the ENTOMOLOGICAL NEWS for 1917, however, very definite reasons for grouping the Embiids, Forficulids and Plecoptera in a single superorder, the Panplecoptera, were given, including the nature of the lateral cervical sclerites which are figured in detail, the ring-like mesothoracic coxae, typically trimerous tarsi, absence of ovipositor and styli, etc.; and this is probably the first citation of definite features of value for determining that the Plecoptera are the closest to the Orthopteroid Embiids of all insects, although a further detailed comparison of the dorsal region of the meso-and metathorax (and the wing bases) of the Embiids and Plecoptera is given in the February, 1918, issue of Psyche, Vol. 25, p. 5,

and the wings of the Embiids and Plecoptera are compared on page 214 of the September, 1922, issue of the Canadian Entomologist (Vol. 54), with a view to demonstrating that the closest relatives of the Plecoptera are the Orthopteroid Embiids, and all of these long precede the casual statement by Martynov, 1924, that the Plecoptera should be included in an Orthopteroid superorder for which he proposes the designation "Orthopteroidea".

In closing, it may be mentioned that the comparison between the Hymenoptera and the rest of the Holometabola, on the one hand, and the Hemipteroid Psocids on the other, as given on page 226 of the October, 1922, issue of the Canadian Entomologist, brings out many reasons for concluding that the Holometabola and the Psocids, etc., were descended from a common Protorthopteroid ancestry; and the adumbrations of the Hymenopterous venation suggested by comparing Figs. 65 and 66 (which was the first suggestion for a revision of the then prevalent interpretation of the homologies of the wing veins of the Hymenoptera) may possibly indicate a more correct interpretation of the Hymenopterous venation than some of those later proposed. In fact, Dr. F. M. Carpenter has recently pointed out that the so-called "Protohymenoptera," supposedly ancestral to the Hymenoptera, are, in reality, merely Megasecopterous insects having nothing to do with the ancestral Hymenoptera, and interpretations of the Hymenopterous venations based upon a comparison with the unrelated Megasecoptera are founded upon too insecure a basis. What makes the matter still more complicated, is that Dr. Tillyard mistook the lower for the upper surface of these wings, and overlooked the subcostal vein which is the key vein for tracing the convex and concave veins in insects, so that his comparison of the venation of the Hymenoptera with that of the Megasecopterous "Protohymenoptera" is thrown completely off by this fact, and the true interpretation of the Hymenopterous venation may eventually turn out to be more nearly like that suggested by the comparison of Figs. 65 and 66 in the above-mentioned article, in the Canadian Entomologist for October, 1922!

The Predatory Enemies of Elateridae (Coleoptera).[1]

By C. A. THOMAS, Pennsylvania State College.

In a recent paper[2] the writer discussed the few recorded examples of the parasites of wireworms. The present paper records the predators known to feed upon the various stages of these insects. It is evident that predators are more important in the natural control of the *Elateridae* than either parasites or diseases.

ACARINA.

Mites have been included among the predatory enemies of Elateridae, although in most instances it is probable that those found upon wireworms are not there primarily to feed upon them. Mite hypopi (Tyroglyphidae) are frequently found closely grouped upon the abdominal segments of wireworms, especially the ninth segment, often so tightly attached as to be unaffected by the larva's movements through the soil. In such instances the larva usually seemed to be entirely unaffected by the hypopi, and fed and molted as usual. In a few instances, however, when the mites become common upon the thorax and head, and cover the spiracles, the wireworm may be weakened by its load. Mites upon wireworms are not at all uncommon under artificial rearing conditions, but are less frequently found in the field. The records of mites found on wireworms are as follows:

Family TROMBIDIIDAE: *Leptus phalangii* (*Acarus phalangii of DeGeer*) fed on juices of adult *Elater ruficaudis*, according to Curtis (1845).

Family PARASITIDAE: Fisher (1889) noted a gamasid mite (*Parasitus*) attached to the body of an *Alaus oculatus* adult.

Family UROPODIDAE: Curtis (1845) stated that *Uropoda umbilica* attached itself to the elytra of *Elater obscurus*.

Family TYROGLYPHIDAE: Tyroglyphid hypopi are sometimes found upon wireworms, and if these wireworms die from disease or other causes, the hypopi may develop into the nymphal

[1] Publication authorized by the Director of the Pennsylvania Agricultural Experiment Station as Technical Paper No. *519*.

[2] "Parasites of Wireworms," ENT. NEWS, XL, 287-293, Nov., 1929

and adult mites and may then feed upon the dead larvae. Those who have noted the occurrence of Tyroglyphids upon wireworms are: Hyslop (1915), on wireworms in his rearing cages; Conradi and Eagerton (1914), who found that *Horistonotus uhleri* Horn larvae became infested with *Rhizoglyphus phylloxerae Riley*, but none of these wireworms matured; Pergande (1882), who found Tyroglyphid hypopi on *Melanotus communis* Gyll. larvae; Masaitas (1929), frequently found *Selatosomus* larvae parasitized by Tyroglyphids in Russia, as high as 33% in the field in 1926; he thought that these mites punctured the skin of the wireworm.

PSEUDOSCORPIONIDA.

Leidy (1877) recorded *Chelifer alaus* as parasitizing adults of *Alaus oculatus*.

ARANEAE.

Many spiders depend largely on what comes to their webs, so that the occurrence of an occasional entangled click beetle is not important. However, Eagerton (1914) reported a small field spider, *Pencetia viridans* Htz. as quite an important enemy of the adults of *Monocrepidius vespertinus* (Fab.) and occasionally of *Horistonotus uhleri*. This spider frequents the upper portion of tasseling corn. Hawkins[3], of the Maine Experiment Station, found an unidentified small grayish spider consuming adults of *Agriotes mancus* Say.

INSECTA: HEMIPTERA.

Conradi and Eagerton (1914), and Eagerton (1914), found *Apiomerus crassipes* Fab. (Family Reduviidae) catching adults of *Monocrepidius vespertinus*, and suspected this and several other hemipterous insects of preying on adults of *Horistonotus uhleri*.

COLEOPTERA.

The members of this order rank second only to birds as predatory enemies of wireworms. Nearly all of the coleoptera feeding on Elateridae belong to the family Carabidae, as shown by the following records. Carabid larvae are subterranean and adapted for feeding on soil insects.

Family CICINDELIDAE: *Cincindela rufiventris* Fab.—ate *Horistonotus uhleri* adults—Conradi and Eagerton (1914).

[3] Correspondence.

Family CARABIDAE: *Steropus* (*Carabus*) *madidus* Fab.—ate wireworms—Curtis (1845).

Calosoma cancellatum Esch. adults—ate *Limonius californicus* Mannh. adults—Graf (1914). *C. semilaeve* Lec.—adults ate *Limonius californicus* Mannh. adults—Graf (1914).

Nebria brevicollis—ate wireworms—Ford (1917).

Scarites sp.—introduced into Hawaii from Brazil—Swezey (1924). *S. subterraneus* Fab.—ate *Phelctes agonus* Say larvae —Writer.

Pterostichus madidus—ate wireworms—Ford (1917). *P.* sp.—ate wireworms—Masaitas (1929).

Poecilus lucublandis Say—ate wireworms—Hawkins, Maine (1929 correspondence).

Ophonus (*Pardileus*) *calceatus* Duft.—ate wireworms—Masaitas (1929).

Broscus cephalotes L.—ate *Limonius pilosus* Lev. and *Agriotes lineatus* L.—Vassiliev (1913, 1914).

In recent correspondence, Headlee stated that a heavy infestation of wireworms occuring in the fall in New Jersey was apparently much reduced by Carabid larvae, so that by the next spring the wireworms had practically disappeared and a tremendous number of undetermined Carabid larvae was found in their place. Whether these Carabids actually killed off the wireworms is not definitely known, but Headlee believed that they had much to do with the disappearance of the latter. Strickland of Alberta, Canada, also said that adult Carabids were the most important insect enemies of wireworms. He believed, however, that the larvae of these Carabids are only of secondary importance, and that they frequently are devoured by wireworms with which they are confined.

Family STAPHYLINIDAE. Hawkins, Maine, in 1929 correspondence, stated that he found *Staphylinus badipes* Lec. eating adults of *Agriotes mancus*.

Family ELATERIDAE. A number of elaterid larvae are predacious and cannibalistic. Conradi and Eagerton (1914) noted that pupae and soft molting larvae of *Horistonotus uhleri* were destroyed by larvae of *Monocrepidius vespertinus*. They also destroy each other when crowded together. Umnov (1913) observed cannibalism among *Agriotes* larvae, while the writer has frequently found larvae of *Monocrepidius lividus* DeG. and *Alaus oculatus* feeding on other wireworms, especially in ex-

perimental cages. Other elaterid genera which contain predacious larva are *Agryphus, Adelocera, Chalcolepidius, Hemirhipus, Melanotus, Pyrophorus* and probably some others. It is not known, however, how much good these wireworms actually do in the field.

DIPTERA.

Only four records of diptera feeding on Elaterids have been found. The flies concerned are members of the families Asilidae and Therevidae. Kirby and Spence (1846) noted an *Asilus* adult caught with an elaterid beetle in its clutches, while Eagerton (1914) found a robber fly, *Proctacanthus brevipennis* Wied. catching adults of *Monocrepidius vespertinus*. Conradi and Eagerton (1914) stated that the same species killed males of *Horistonotus uhleri* in South Carolina.

Of the THEREVIDAE, Hyslop (1910) found *Thereva egressa* Coq. larvae feeding on wireworms at Pullman, Washington. Larvae of *Psilocephala aldrichi* Coq. and *P. munda* Coq. were also associated with these wireworms, although not actually seen feeding on them. Conradi and Eagerton (1914) noted a larva, probably *P. pictipennis* Wied. (= Epomyia pictipennis Wied.) eating a *Horistonotus uhleri* larva in the field.

HYMENOPTERA.

Ants occasionally devour weak or dead click beetles found on the ground. Kirby and Spence (1846) told of several ants dragging an Elaterid. Horton (1918) stated that the adult of *Limonius subauratus* Lec., which feeds on citrus scale excretions, is fearless of the Argentine ant, which attacks other insects.

(To be continued).

A Correction (Hemip.: Aphididae).

An error in my article on Typha Insects in the February NEWS has been called to my attention. *Thripsaphis ballii* Gill. recorded on page 37 of that issue is an Hemipteron and does not belong under Thysanoptera as listed. This species was arranged in the wrong group at Washington and came to me, as listed, in a letter.—ARTHUR C. COLE, Jr., Department of Zoology and Entomology, the Ohio State University, Columbus.

A New Experience (Coleop.: Cicindelidae).

On February 22, 1931, I took a stroll along the tracks of the Chicago, Milwaukee, St. Paul and Pacific Railway, leading northwest out of this city. Turning over stones, bits of wood and other débris lying on the railway embankment, I was indeed surprised to find a specimen of *Cicindela purpurea* under a brick that lay on the surface of a sandy spot on otherwise bare soil. I have collected insects here about Beaver Dam more or less regularly since 1888, my favorite collecting being under débris and bark in early spring, but never before have I found a hibernating tiger beetle. On being taken into a warm room the tiger immediately showed life. As a lad living in Fayette County, Illoinois, I often found Cicindelas hibernating in or under rotten logs and stumps, but this is my first experience in finding one in Wisconsin.

W. E. SNYDER, Beaver Dam, Wisconsin.

Entomological Literature

COMPILED BY LAURA S. MACKEY UNDER THE SUPERVISION OF E. T. CRESSON, JR.

Under the above head it is intended to note papers received at the Academy of Natural Sciences, of Philadelphia, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

The numbers **within brackets** [ ] refer to the journals, as numbered in the list of Periodicals and Serials published in the January and June numbers (or which may be secured from the publisher of Entomological News for 10c), in which the paper appeared. The number of, or annual **volume,** and in some cases the part, heft, &c. the latter **within** ( ) follows; then the pagination follows the **colon** :

All continued papers, with few exceptions, are recorded only at their first installments.

*Papers containing new forms or names have an * preceding the author's name.

(S) Papers pertaining exclusively to neotropical species, and not so indicated in the title, have the symbol (S) at the end of the title of the paper.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

☞ *Note the change in the method of citing the bibliographical references, as explained above.*

Papers published in the Entomological News are not listed.

GENERAL.—Bijok, J.—Winterarbeit einer entomologischen schülergemeinschaft. [14] 44: 326-329, ill. **Breakey, E. P.**—Additional notes on the natural enemies of the iris borer, Macronoctua onusta. [7] 24: 40-44. **Emerton, J. H.**—Obituary. By N. Criddle. [Canadian Field Nat.] 45: 90. **Hopping, R.**—Two very common mistakes of entomological writers. [4] 63: 72-73. **Lutz, F. E.**—In defense of

insects. [76] 1931: 367-369. **Rowell, L. S.**—Preparation of bee slides. [68] 73: 320. **Stiles, C. W.**—Is an international zoological nomenclature practicable? [68] 73: 349-354. **Wheeler, W. M.**—Award of the Leidy medal of the Academy of Natural Sciences of Philadelphia to Dr. W. M. Wheeler. [68] 73: 308. **Wucherpfennig, F.**—Amazonas-sammelreise 1930-31. [17] 48: 59-61, ill., cont. ***Zerny, H.**—Ergebnisse einer zoologischen sammelreise nach Brasilien, insbesondere in das Amazonasgebiet. [An. Nat. Mus. Wien] 44. III. Diptera: Dolichopodidae. Par O. Parent. 5-26. IV. Mantodea. Von M. Beier. 27-32, ill. V. Micro-Lepidoptera. By E. Meyrick. 223-268, ill. VI. Lepidoptera: Megalopygidae. Von W. Hopp. 269-277, ill.

ANATOMY, PHYSIOLOGY, ETC.—Allard, H. A.—The photoperiodism of the firefly Photinus pyralis; its relation to the evening twilight and other conditions. [10] 33: 49-58, ill. **Andrews, E. A.**—Honeydew reflexes. [Physiol. Zool.] 3: 467-484. **Gerould, J. H.**—Premature reversal of heart beat in Bombyx. [68] 73: 323-325. **Gray, J.**—The post-embryological development of the digestive system in Homaledra sabalella. [7] 24: 45-107, ill. **Gresson, R. A. R.**—Yolk-formation in Periplaneta orientalis. [53] 74: 257-274, ill. **Henson, H.**—The structure and post-embryonic development of Vanessa urticae (Lepidoptera). [53] 74: 321-360, ill. **Hickman, J. R.**—Respiration of the Haliplidae. [Pap. Michigan Acad. Sci. Arts & Letters] 13: 277-289, ill. **Ripper, W.**—Versuch einer kritik der homologiefrage der arthropodentracheen. [94] 138: 303-369, ill. **Robertson, W. R. B.**—Hybrid vigor—a factor in tettigid parthenogenesis? [90] 65: 165-172. **Sikes & Wigglesworth.**—The hatching of insects from the egg, and the appearance of air in the tracheal system. [53] 74: 165-192, ill. **Smith, F. F.**—A further comment on the "Pumping" habit of plant lice. [68] 73: 364. **Stanley, J.**—Studies on the musculatory system and mouth parts of Laelaps echidninus. [7] 24: 12pp., ill. **Swingle, M. C.**—Notes on digestion in seven species of insects. [7] 24: 177-180. **Wigglesworth, V. B.**—Effect of desiccation on the bed bug (Cimex lectularius). [31] 127: 307-308, ill. **Wigglesworth, V. P.**—Digestion in Chrysops silacea (Tabanidae). [Parasitology] 23: 73-76.

ARACHNIDA AND MYRIOPODA.—*Beier, M.—Die Pseudoskorpione des Wiener Naturhistorischen Museums. [An. Nat. Mus. Wien] 44: 199-222, ill. (S).

THE SMALLER ORDERS OF INSECTS.—*Calvert, P. P.—The generic characters and the species of Palaemnema (Agrionidae). [1] 57: 110pp., ill. (S). **Lestage, J. A.**—Contribution à l'étude des Ephéméroptères. VIII. Les Ephéméroptères du Chili. [33] 71: 41-60, ill. ***McDunnough, J.**—The bicolor group of the genus Ephemerella with particular reference to the nymphal stages (Ephemeroptera). [4] 63: 30-42; 61-68, ill. **Mills, H. B.**—New Nearctic Collembola. [40] 464: 11pp., ill. **Nichols, E. R.**—"An attempt to classify species of termites from mandibles of workers and nymphs". [13] 23: 18pp., ill.

ORTHOPTERA.—*Beier, M.—(See **Zerny,** under General). ***Chopard, L.**—Sur une espèce nouvelle du genre Eneoptera confondue avec l'E. surinamensis [Gryllidae]. (S). [25] 1931: 14-16, ill. **Hebard, M.**—The Orthoptera of Alberta. [Proc. Acad. Nat. Sci. Phila.] 82: 377-403, ill. **Hebard, M.**—Studies in Lower Californian Orthoptera. (S). [1] 57: 113-127, ill. ***Karny, H. H.**—Revision der Gryllacriden des Naturhistorischen Museums in Wien einschliesslich der collection Brunner v. Wattenwyl. [An. Nat. Mus. Wien] 44: 45-198, ill. (S).

HEMIPTERA.—Jaczewski, T.—The male of Mesoveloidea williamsi. Further notes on the American species of Mesovelia. (Heteroptera). [10] 33: 64-65; 65-66, ill. ***Lallemand, V.**—Quelques espèces et variétés nouvelles de Cercopides exotiques des collections du Musée Zoologique de Hamburg. (S). [Folia Zool. et Hydrobiol., Riga] 2: 164-169. ***Melin, D.**—Hemiptera from South and Central America. II. (Contributions to a revision of the genus Phymata.) [83] 22, No. 2: 40pp., ill. **Miller, N. C. E.**—Larval Heteroptera secreting an obnoxious fluid from the thorax. [8] 67: 54-55. **Muir, F.**—A criticism of Dr. Hansen's theory of the maxillula in Hemiptera. [8] 67: 51-53. **Readio, P. A.**—Dormancy in Reduvius personatus. [7] 24: 19-39, ill. **Schmidt, E.**—Gynopygoplax schultzei, eine neue Cercopide von den Philippinen. [17] 48: 64. **Silvey, J. K. G.**—Observations on the life-history of Rheumatobates rileyi (Gerridae). [Pap. Michigan Acad. Sci. Arts & Letters] 13: 433-446, ill.

LEPIDOPTERA.—*Busck, A.—Two new Peruvian Microlepidoptera of economic importance [Gelechiidae and Oecophoridae]. [10] 33: 59-63, ill. **Cook, W. C.**—An

ecologically annotated list of the Phalaenidae of Montana. [4] 63: 25-30. ***Gehlen, B.**—Neue Sphingiden. [14] 44: 362-364, ill. (S). **Harris, L.**—A list of the butterflies of Georgia. [Trans. Georgia Nat. Club] 1: 27pp., ill. **Hoffman, F.**—Beiträge zur naturgeschichte brasilianischer schmetterlinge. II. [45] 26: 1-8. **Hoffman, F.**—Euselasia eucerus. (S). [17] 48: 55-56. ***Hopp, W.**—(See **Zerny** under General). (S). **McDunnough, J.**—Note on the larvae of Metrea ostreonalis (Pyraustinae). [4] 63: 50. ***McDunnough, J.**—A new race of Sphinx gordius. [4] 63: 73. ***Meyrick, E.**—(See **Zerny** under General). (S). ***Niepelt, W.**—Neue formen exotischer Lepidopteren. (S). [18] 24: 485-486. **Shepard, H. H.**—Additions and corrections to Lindsey's "Types of Hesperioid genera". [7] 24: 173-176. **Walker, J. J.**—Notes on a satyrine butterfly (Satyrus azorinus) from the Azores. [Pro. Ent. Soc. London] 5: 77-81.

DIPTERA.—Aldrich, J. M.—Collecting flies in the west. [Smiths. Inst.] Publ. 3111: 107-112, ill. **Bromley, S. W.**—New neotropical Andrenosoma (Asilidae) [1] 57: 129-134. ***Curran, C. H.**—The nearctic species of the Nemestrinid genus Rhynchocephalus. [4] 63: 68-72. **Curran, C. H.**—New species of Chrysopilus from the Neotropical region (Rhagionidae). [40] 462: 9pp. ***Edwards, F. W.**—New neotropical nematocerous Diptera. (S). [75] 7: 255-261. ***Hall, D. G.**—New North American Sarcophagidae. [7] 24: 181-182, ill. **Mukerji, S.**—Morphology of the pharynx of female Culicoides and its taxonomic importance. [31] 127: 339-340, ill. ***Parent, O.**—(See **Zerny** under General). **Twinn, C. R.**—Observations on some aquatic animal and plant enemies of mosquitoes. [4] 63: 51-61. **Van Duzee, M. C.**—New species of Dolichopodidae taken by Mr. and Mrs. F. W. Edwards in South America. [75] 7: 243-255, ill. **Wu, Y. F.**—A contribution to the biology of Simulium. [Pap. Michigan Acad. Sci. Arts & Letters] 13: 543-599.

COLEOPTERA.—Bradley, J. C.—A manual of the genera of beetles of America north of Mexico. Ithaca 1930. 360pp. ***Bridwell, J. C.**—Bruchidae infesting seeds of Compositae, with descriptions of new genera and species. (S). [10] 33: 37-42. ***Fisher, W. S.**—A new leaf mining Buprestid from the Canal Zone. [10] 33: 42-43. **Hickman, J. R.**—Contribution to the biology of the Haliplidae. [7] 24: 129-142. ***Pic, M.**—Neue exotische Coleopteren (Malaco-

dermata). (S). [26] 11: 77-78. **Satterthwait, A. F.**—Key to known pupae of the genus Calendra, with host-plant and distribution notes. [7] 24: 143-172, ill.

HYMENOPTERA.—Clausen, C. P.—Biological observations on Agriotypus. [10] 33: 29-37, ill. **Cockerell, T. D. A.**—Rocky Mountain bees. II [40] 458: 20pp. **Compere, H.**—A revision of the species of Coccophagus a genus of hymenopterous coccid-inhabiting parasites. [50] 78, Art. 7: 132pp., ill. **Parker, H. L.**—Macrocentrus gifuensis, a polyembryonic braconid parasite in the European corn borer. [U. S. Dept. Agric.] Tech. Bull. 230: 62pp., ill. **Ross, H. H.**—Sawflies of the sub-family Dolerinae of America north of Mexico. [Ill. Biol. Monogr.] 12: 7-116, ill. ***Ross, H. H.**—Notes on the sawfly subfamily Tenthredininae, with descriptions of new forms. [7] 24: 108-128.

A CONTRIBUTION TO THE KNOWLEDGE OF FLORIDA ODONATA by C. FRANCIS BYERS, Ph.D., Assistant Professor of Biology, University of Florida, University of Florida Publications, Biological Science Series, Vol. I, No. 1, pages 1-327, frontispiece, eleven plates with 115 figures, and 19 text figures. May, 1930.

The above publication is Dr. Byers' thesis for his doctorate at the University of Michigan, and as the title states, is a contribution to a knowledge of Florida Odonata, and it must be judged on that basis rather than as a handbook, though its subject matter includes all the essentials of a handbook except an index and glossary.

"This, then, is the problem the author has set for himself—an investigation of the Odonata of the State of Florida: (1) to determine the species of dragonflies found therein, and to write keys and descriptions of them; (2) to determine the life histories and habits of as many of these species as it is possible or feasible; (3) to analyze the state as an environmental area—geologic, geographic, climatologic and biotic—and to speculate upon the effect of these factors on the occurrence, distribution, and migration of Florida species of Odonata." Against this problem Dr. Byers marshalls his data with initiative, skill, and logic in an altogether creditable and often original manner. No other state in the Union offers more definitely "an environmental area" favorably situated to give clean cut answers to his questions than the state he selected for his study.

Part I is an annotated list of the Odonata of Florida; first,

those collected or identified by the author; second, reliable records by others; and third, questionable records. For general reasons and particularly since the book has no index, it might have been better to have included the subject matter of Part I, Part II, and 3 (Ecological observations on species of Florida Odonata) under Part III, in one part under each species. For example, to obtain the information Dr. Byers has brought together on *Tachopteryx thoreyi* in Florida one must refer to pages 11, 43, and 242-244.

In the light of our present knowledge, the sequence of families and subfamilies proposed by de Selys in 1895 and generally used since then, sometimes with minor changes, seems preferable to that used by Dr. Byers in the present paper.

The first two lists of the Annotated List gives a total for the state of 105 species but the three Trameas on page 17 probably need verification. In a letter of October 21, 1930, Dr. Byers writes me that *Erythrodiplax umbrata* taken by himself in both Dade and Alachua Counties, should be transferred from List II to List I, and to the latter list he now adds *Macromia georgina, Somatochlora linearis, Lestes rectangularis,* and *Telebasis salva.* The last species was also taken in Florida by Jesse H. Williamson in 1921, who in the same year took *Orthemis ferruginea* at Miami, and *Macrodiplax balteata* at Fort Myers and Enterprise. If *Ischnura credula* is not a synonym of *I. ramburii,* the Florida specimens listed under these two names almost certainly belong to one species.

Dr. Byers lists a total of 1592 specimens studied, but the total of males, females, and nymphs is only 1527. This is probably to be explained by duplication in counting a reared nymph as two specimens. The ratio of males (697) to females (618) is remarkable and indicates that many specimens were taken at a distance from water. But still more remarkable is the ratio of species (91) to the number of adults collected (1315). At first I thought Dr. Byers might have identified in the field and collected or saved only those he found of interest but such is evidently not the case as the following facts will show. *Agrion dimidiatum* from four counties is represented by only 13 specimens, while *A. maculatum* from two counties is represented by 77 specimens. Both species are easily recognized in the field. Of fourteen species of *Enallagma,* two species account for fifty per cent of all the Enallagmas collected, and nine species are represented by 8 or fewer specimens each. Of the Gomphines, with ten species represented by a total of 65 specimens, two species account for 44 of these,

seven species have each 4 or fewer specimens, and four are represented each by a single specimen. The story is about the same in the Aeshnines with nine species and 70 specimens; two species account for 42 of these and five species are represented each by 3 or fewer specimens. In the Libellulines with twenty-seven species and 461 specimens, four species account for over fifty-five percent of the specimens and for nearly twelve percent of all the material studied and representing ninety-one species. There are 35 more specimens of *Pachydiplax longipennis* and *Erythemis simplicicollis* together than all the Gomphines and Aeshnines. And of these two common Libellulines, generally easily recognized in the field, there are more specimens than there are specimens of the fourteen species of *Enallagma,* which are not always determinable until collected and studied, especially when the fauna is new to the collector. All this suggests that there are in the state a few species of wide geographic and seasonal range, and many other species much more local and on the wing for briefer seasons. Because of this, Dr. Byers sampling here and there all over the state at different seasons, was able to record ninety-one species, represented by so relatively few specimens. I do not think his general results or conclusions are in any way invalidated by this limited material, but his "Florida Biotic Areas" and his "Ecological observations on species of Florida Odonata" must be read with this point in mind.

During its ontogeny the imago dragonfly may undergo many color changes and at every point these colors may be varied or even changed by environmental factors. In a long series of dried specimens of one species everyone knows the different and unpredictable changes which take place. So I think Dr. Byers' attempt to describe the colors of dragonflies in terms of Ridgway (see page 20, second paragraph above the key) is likely to be confusing, if not misleading, in most cases. It certainly would be done, but in each species it would involve an amount of work and of material far beyond the scope of Dr. Byers' thesis. With this slight criticism the taxonomy of the Florida Odonata is very well done, with a commendable approach to uniformity of treatment and with a key which looks as if it would function. Why the total length, as a cardinal measurement, should be generally, but not always, substituted for the old length of abdomen is not clear, as it involves more parts which may be lost, crushed or jammed out of position; and I see no advantage in dropping the seventy-five year old custom of measuring the hind wing to begin

measuring the front wing. In the same way the terminology for thoracic stripes, especially of Gomphines, introduced in Needham's Handbook, is, I think, not as good as the old terminology, and in using it Dr. Byers has introduced some confusion. For example, on page 22, the Roman numerals I and II designate dark stripes, while on pages 45 and 55 Roman numerals are used for pale stripes of the same species, though at least once, as, for example, in describing *Gomphus australis* on page 56, Roman numerals in either sense are abandoned, and the older and preferable terminology is employed.

In the second line from the bottom on page 20, following *Wings* insert *usually*. Rubric 2 on page 21 is not true throughout the family as some Aeshnines and Gomphines have no brace vein. On page 22, the first sentence of the second section of rubric 18 does not agree with the second section of rubric 24. In the second sentence of both sections of rubric 18, Dr. Byers uses upper and lower sectors of the arculus correctly, but beginning on page 67 and continuing through the discussion of the Aeshnines the terms are not correctly used. The position of *Nannothemis* among the Cordulines in the key might have been advantageously avoided. On page 24, line fifteen from bottom, for 69 read 67. In the first section of rubric 49, change *Libellula* to bold face to correspond with other genera in the key. The second section of the same rubric is incorrect or ambiguous. In rubric 52 "brown" is not in Ridgway and in any case is hardly applicable to *auripennis*, and the "purple" of Ridgway is too vivid to apply to *jesseana*. The first section of rubric 60 is not diagnostic for the species placed under it; there is obviously some confusion in the key in the second section of rubric 61 and rubrics 63 and 64; *Erythrodiplax minuscula* and *berenice* have each less than 11-17 antenodals; and the key does not run out to *Erythrodiplax* as it should. The handling of the sexes of *Hetaerina* in rubrics 76 and 77 is not in conformity with and not as good as the handling of *Lestes* and other genera. Apparently the first section of rubric 96 should be combined with the second section of 95 or omitted, and the second section of 96 should be omitted. In the second section of rubric 106, "color predominantly light yellow" applies only to males and the same qualification should be made on pages 189 and 190 where the description of the adult female applies only to tenerals. In the second section of rubric 108, "the stigma uniform in color" does not apply to the stigma of the front wing of *ramburii* and *credula*. On page 38 there is some sort of evidence for

taking *deplanata* and *lydia* out of *Libellula,* and had this been done the key might have been arranged to run out to *Libellula* which could then have been treated as are *Erythrodiplax, Tramea,* and *Pantala.* On page 39, second section of rubric 66, *Ischnura* should be in bold face.

On page 41, third line, for *psi* read *upsilon.* On the same page it is hardly correct to say that the author has a list of 119 species for Florida. Counting the four additions since the book was published, the list is about 106-109. And the statement in the last sentence on the same page is too broad. Dr. Calvert has called my attention to an assertion by Hagen, Stet. Ent. Zeit., XIV, page 100, 1853, that the first author to describe and figure nymphs was Rondelet in 1555 (see first paragraph, page 41).

The arduous task of describing the Florida dragonflies in detail has been well, and, in general, uniformly done by Dr. Byers. If a general criticism may be permitted it seems to me that repetition in the text of characters well stated in the preceding key is hardly worth the effort. For example, page 21, rubric 2, "Stigma with a brace vein at its proximal end" is repeated in substance on page 42 (*Aeshnidae*); on page 45 (*Gomphinae*); and again on the same page (*Negomphoides*). And, as another example, on page 54, every character but one in the first paragraph is repeated in the last paragraph on the same page. In this connection the general question might be raised whether or not a description, based on a few specimens, of a well-known and widely distributed species, is worth the arduous labor involved.

On page 42 the second paragraph might be questioned. In the first paragraph under Petalurinae, "Selys" should be enclosed in parentheses, if one is going to use them at all in this connection. On page 45, last line in the second paragraph, for *are two* read *is an undescribed.* On page 51, second line, for *short* read *long.* On page 53, last line, Dr. Calvert has called my attention to the fact that Hagen (Trans. Am. Ent. Soc. XII, p. 255, 1885) described a reared nymph. On page 56, under *australis,* for *H. wing* read *F. wing.* On page 70, lines 5 and 4 from bottom, the wings in females, in addition to color described by Dr. Byers, may be entirely clear or may have the basal area pale and the more distal part suffused. Dr. Byers' discussion on pages 82 and 83 has probably not taken the Oriental fauna enough into account, and his use of Cordulegasteridae differs materially from that of Fraser, 1929. On page 83, tenth line from bottom, for *Cordulegaster* read

Thecaphora, and omit the parentheses around Selys; eighth line from bottom, for *C.* read *Aeshna;* and in seventh line from top, on page 84, make same change for *Cordulegaster.* On page 87, thirteenth line from bottom, for 1830 read 1839. Dr. Byers' undetermined *Neurocordulia,* pages 98 and 99, may as well prove to be *clara* as any of the species he mentions. On pages 100 and 101, the lengths given for *T. petechialis* and *T. stella* are surely those of abdomens and not of entire insects.

On page 104, eleventh line from bottom, for *seven* read *eight;* on the same page, third line from bottom, for *two* read *eleven;* and in second line from bottom for *New World* read *North America,* since five genera of this tribe occur in the New World. Referring to the last line in the first paragraph, page 137, Dr. Calvert has called my attention to a description by himself in Univ. Iowa Stud. Nat. Hist. XII, No. 2, page 25. 1928; and in the same paper, pages 30-35, nymphs of several species of *Erythemis* are discussed (see 3rd paragraph, page 141). The description of *Dythemis rufinervis,* pages 143 and 144, may prove misleading and this is especially true of that of the female, which does not agree with any specimens I have seen.

On page 152, the second sentence in the first paragraph, some Zygoptera rest with horizontal wings. In the second paragraph on page 154, the second sentence would probably be clearer as follows: Wings usually paler brown in color; stigma white. On page 163 in the first line of the third paragraph "about six" would be nearer right than "two". In the sixth line of the same paragraph for *Coenagrionidae* read *Coenagrioninae.* On page 164, first paragraph, first line, for *family* read *subfamily;* and the largest species of the Lestinae do not belong to the genus *Lestes.* On page 175, last sentence in third paragraph is incorrect. On page 179 seventh line, for *Phylogenetically* read *Morphologically.*

Dr. Byers gives an excellent account of the geology, physical geography, and climate of Florida, but I am unable to see that he shows any relation of the first of these to the present dragonfly fauna, which it seems, as far as definite conclusions are possible, is entirely dependent on the present geography and climate, the vital points of which are the proximity of the northern continental land mass, the narrowness and incompleteness of barriers separating it from tropical areas, the present climate, and the diverse aquatic habitats within the state. To be specific, what has geology to do with the dis-

tribution in North America of *Tachopteryx thoreyi* and *Nannothemis bella?*

Any attempt to associate certain dragonflies with "natural ecological areas based principally on the dominant type of vegetation" is, I believe, futile in the case of Florida hammocks and coniferous forests (page 226). Prolonged collecting there would show, as casual visitors, all the Florida dragonflies which do not confine themselves as adults to the immediate vicinity of their nymphal homes, and this means many of the Anisoptera and some of the Zygoptera. A discussion of major or typical habitats if it is to be exact in detail must be based probably entirely on nymphal life, and when adults are considered their teneral life will probably be of the most significance. Take an extreme case in adult life to make this point clear: What can be said of the habitat of a dragonfly which circles a pool of waste oil at an oil pumping station, congregates in great numbers over rain-flooded cornfields, frequents dredged ditches and abandoned gravel pits, hovers over a farm yard watering trough and a fountain in the city park,—and lays eggs in all of them; and then leaves a village in the center of a continent, where it has been joyously patrolling an oiled street, to take its station on a ship five hundred miles from land? In any case a town can hardly be considered a "highly artificial habitat" (page 241, in last line of which for *bifida* read *nervosa*).

On page 242 Dr. Byers takes up a discussion of the ecology of Florida dragonflies and here he is at his best, telling his story clearly and vividly, and describing the previously unknown nymphs of seven species. In some cases observations are not numerous enough to warrant the drawing of general conclusions. My own experience has been that in many cases I find the greatest difficulty in arriving at such conclusions in dealing with species which I observe oftenest, and this is especially true of the Anisoptera. After over a quarter of a century I cannot tell a "good" Macromia day. So comments on and discussions of Dr. Byers' observations could be prolonged to great lengths. To mention one case, his first sentence under *Epiaeschna heros*, page 256, contains statements of habits which are entirely different from those which have come under my own limited observations of this species.

Under the discussion of fossil Odonata, page 270, Dr. Byers has apparently overlooked the latest work of Kennedy and Tillyard in which the conclusion reached as to the phylogeny of the Zygoptera is exactly the opposite of that stated on page

271. On page 272, in the phylogenetic diagram, I do not know why Neotropic is placed in parentheses under Epallaginae as the subfamily occurs in every region but the Nearctic, and is best represented in the Oriental.

The fossil record unfortunately is insufficient for any chorological discussion, as defined by Dr. Byers, of the present dragonfly fauna of Florida. On the other hand, when discussing the present Florida fauna and its relations to dragonfly faunas adjacent to it, Dr. Byers is again on solid ground, and he has accumulated and presented his extensive data in a masterly way. Certainly his classification of certain species as nearctic, neotropic, and endemic invites discussion which may result in some changes. His use of the word "endemic" is not in the generally accepted sense, and may be translated apparently as "originating in", as for example in Groups C and D at the bottom of page 276. The five species listed under C, page 275, should be checked by the reader against the Annotated List, pages 11-17. On page 274, at the right of the diagram, transpose *neotropica* and *nearctica*.

The final pages (282-302) of the text discuss very completely and suggestively the "Factors of Distribution", with enough general and controversial matter included to arouse the interest of the general reader. There are two or three minor mistakes to which attention might be called: on page 285, second paragraph, male Zygoptera do not hold the female by the head; on page 285 and 290, copulation in mid-air is rare or accidental and I am not sure it is universal for even a single species; and on page 290, endophytic oviposition occurs in other locations than living aquatic vegetation.

The basis for the arrangement of titles in the bibliography and for the separation of titles into Parts I and II, is not clear. And the arrangement is not good, unless there is some reason for it which I have overlooked. The fourteen Florida habitat photographs, figures 102-115, illustrate beautifully many of the extremely diverse habitats in which it was Dr. Byers' good fortune and pleasure to collect, observe, and philosophize.—E. B. WILLIAMSON.

OBITUARY.

Prof. JOHN HENRY COMSTOCK, emeritus professor of entomology at Cornell University, died at Ithaca on March 20, after a prolonged illness. He was born February 24, 1849.

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and only when necessary those at the top (being longest in) are discontinued.

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